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Thomas et al.

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(54) LOW PROFILE COMPACT TOOL CARRIERS

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(51) **Int. Cl.**

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B66F 9/075	(2006.01)
B66F 9/22	(2006.01)
B66F 9/06	(2006.01)

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CPC ... ***B60P 1/50*** (2013.01); ***B66F 9/06*** (2013.01); ***B66F 9/07572*** (2013.01); ***B66F 9/22*** (2013.01)

(58) **Field of Classification Search**
CPC B60P 1/50; B66F 9/06; B66F 9/07572; B66F 9/22; E02F 3/34; E02F 3/3405; E02F 3/3414
USPC 414/685, 686, 722, 909; 180/89.1, 311
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,117,610	A *	10/1978	Yates	37/409
4,239,444	A *	12/1980	Schmelzer	414/685
5,169,278	A	12/1992	Hoechst et al.	
5,470,190	A	11/1995	Bamford et al.	
5,542,814	A	8/1996	Ashcroft et al.	
5,609,464	A	3/1997	Moffitt et al.	
6,325,589	B1	12/2001	Jang et al.	
6,474,933	B1	11/2002	Hoechst et al.	
6,616,398	B2	9/2003	Dershem et al.	
6,695,568	B2	2/2004	Bares et al.	
7,214,026	B2	5/2007	Hilvers et al.	
7,264,435	B2	9/2007	Layko et al.	
7,695,236	B2 *	4/2010	Green	414/486
7,980,569	B2 *	7/2011	Azure et al.	280/32.5
8,152,433	B2	4/2012	Yamada et al.	

(Continued)

FOREIGN PATENT DOCUMENTS

GB	2368573	A	5/2002
JP	2006307498	A	11/2006

OTHER PUBLICATIONS

ISO 3411:2007, Earth-moving machinery—Physical dimensions of operators and minimum operator space envelope, dated Jul. 2007, pp. 24.

(Continued)

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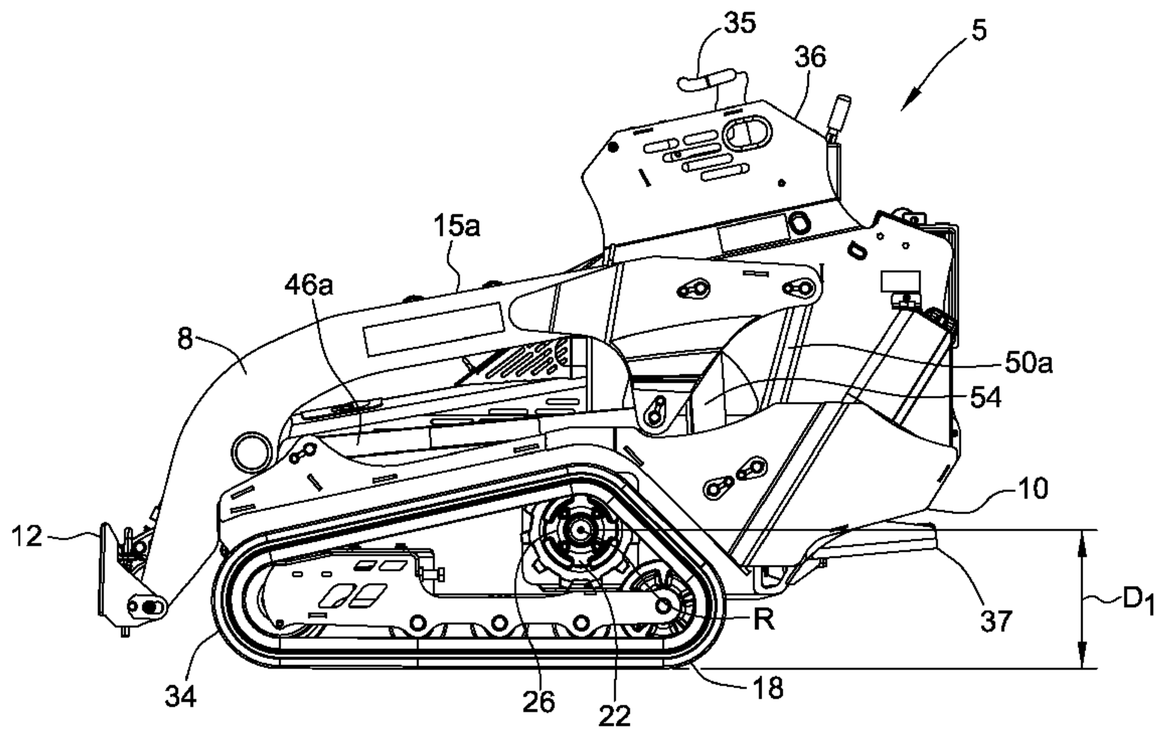
(57) **ABSTRACT**

Compact tool carriers having a loader mounted to a low-profile mainframe are disclosed. In some embodiments, the pivot points of the mainframe about which the loader is pivoted are low relative to the mainframe to reduce the mainframe size and to lower the center of gravity to improve the stability of the compact tool carrier during use.

20 Claims, 7 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

8,821,104	B2 *	9/2014	Yasuda et al.	414/685
2007/0128012	A1	6/2007	Yamada et al.	
2007/0132204	A1	6/2007	Sewell	
2009/0116943	A1 *	5/2009	Valere	414/467
2012/0305025	A1 *	12/2012	Helbig et al.	134/6
2014/0271078	A1	9/2014	Koch	

OTHER PUBLICATIONS

ISO 6682:2008, Earth-moving machinery—Zones of comfort and reach for controls, dated Sep. 2008, pp. 18.
Bobcat, Mini Track Loaders, available before Feb. 20, 2015, pp. 1.
Toro, Dingo Compact Utility Loader, available before Feb. 20, 2015, pp. 1.
Ditch Witch, SK850 Mini Skid Steer, available before Feb. 20, 2015, pp. 1.
Cat, 252B Skid Steer Loader, available before Feb. 20, 2015, pp. 1.
Deere, 318D Skid Steer, available before Feb. 20, 2015, pp. 1.
New Holland, C232 Skid Steer Loader, available before Feb. 20, 2015, pp. 1.
JCB, 150T Tracked Skid Steer, available before Feb. 20, 2015, pp. 1.
Kubota, SVL75 Compact Track Loader, available before Feb. 20, 2015, pp. 1.
Gehl, V270 Vertical Lift Skid Loader, available before Feb. 20, 2015, pp. 1.
Bobcat, T190 Compact Track Loader, available before Feb. 20, 2015, pp. 1.
Yanmar, S-28-V Skid Steer, available before Feb. 20, 2015, pp. 1.

* cited by examiner

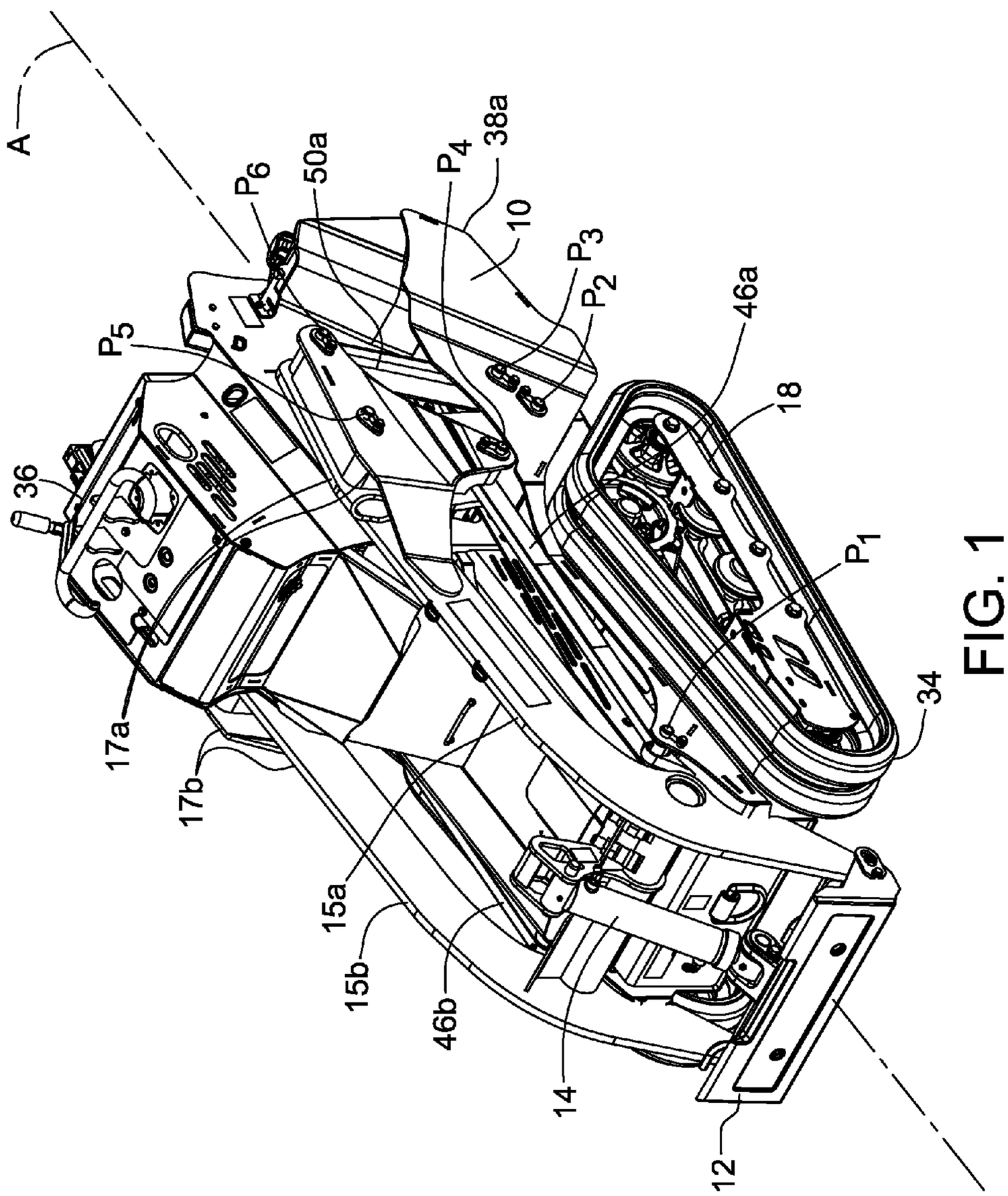


FIG. 1

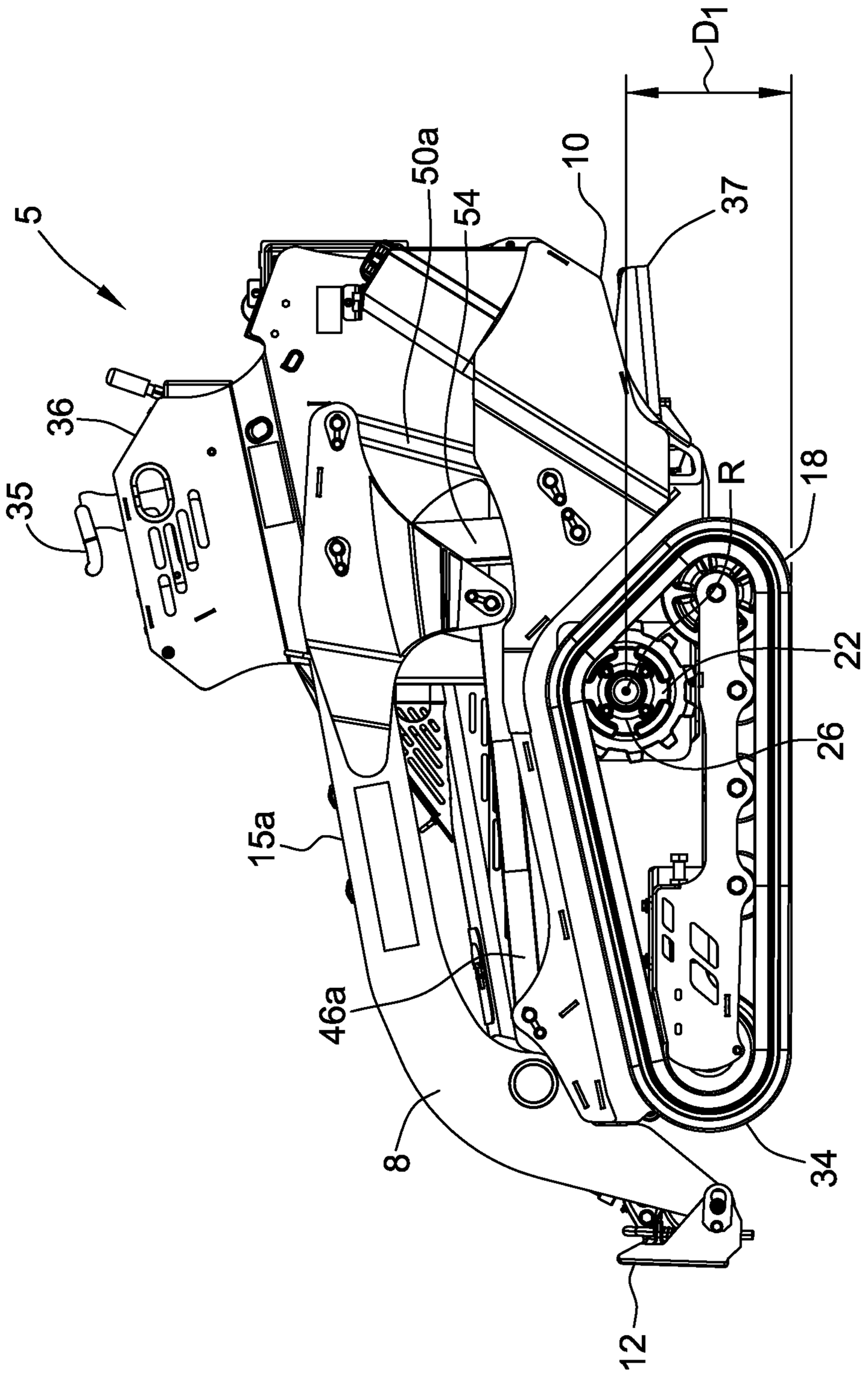


FIG. 2

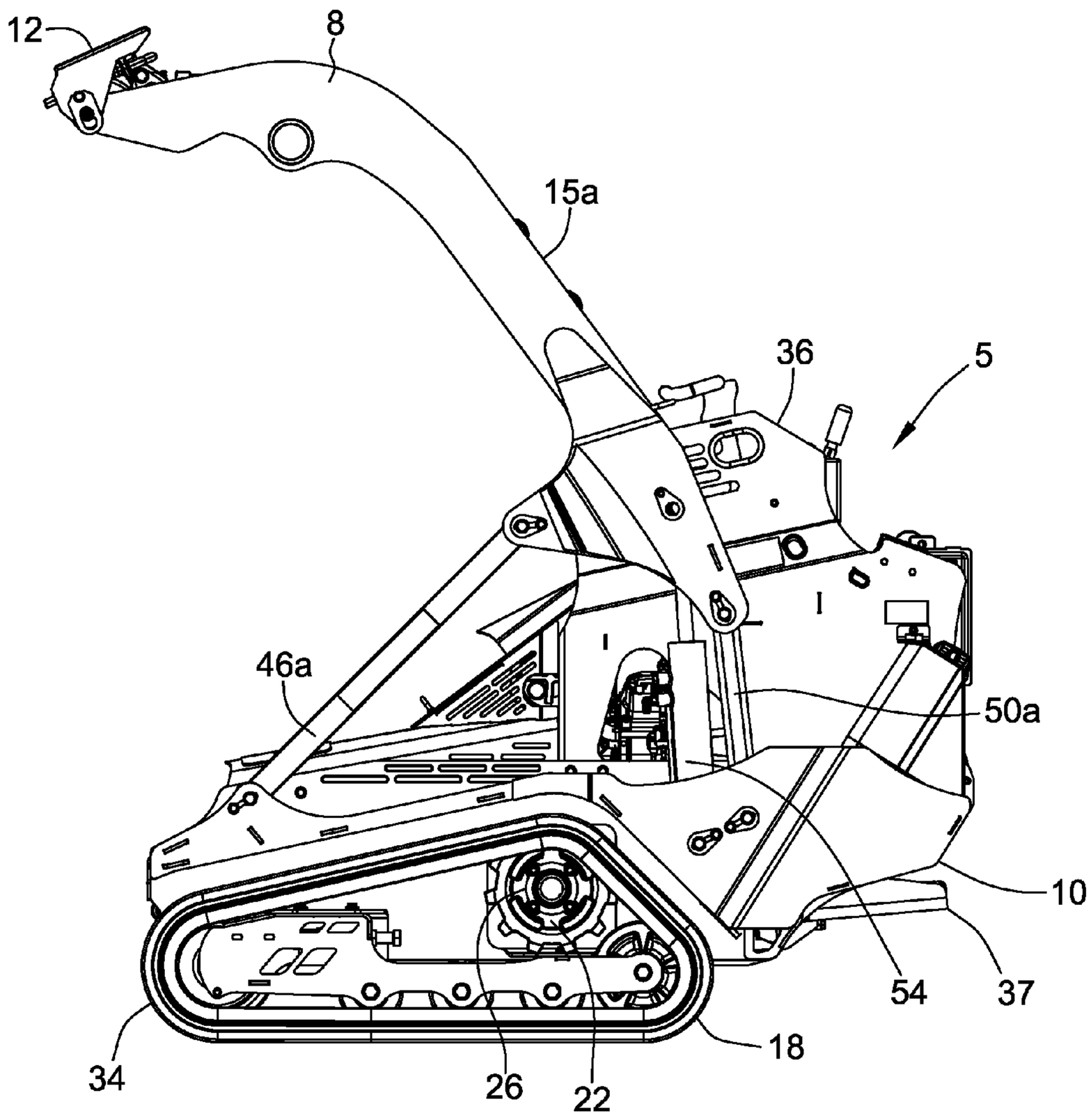


FIG. 3

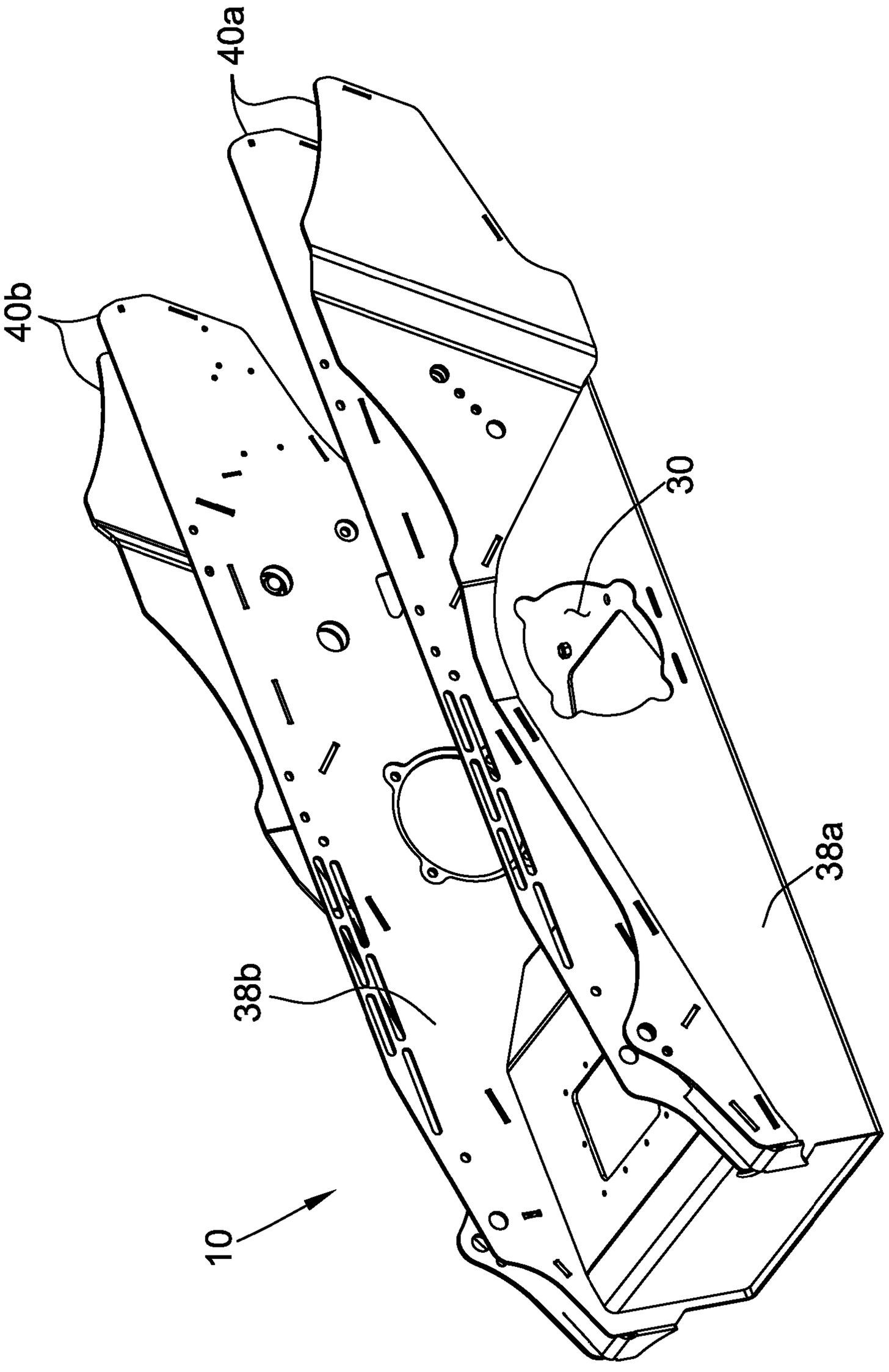


FIG. 4

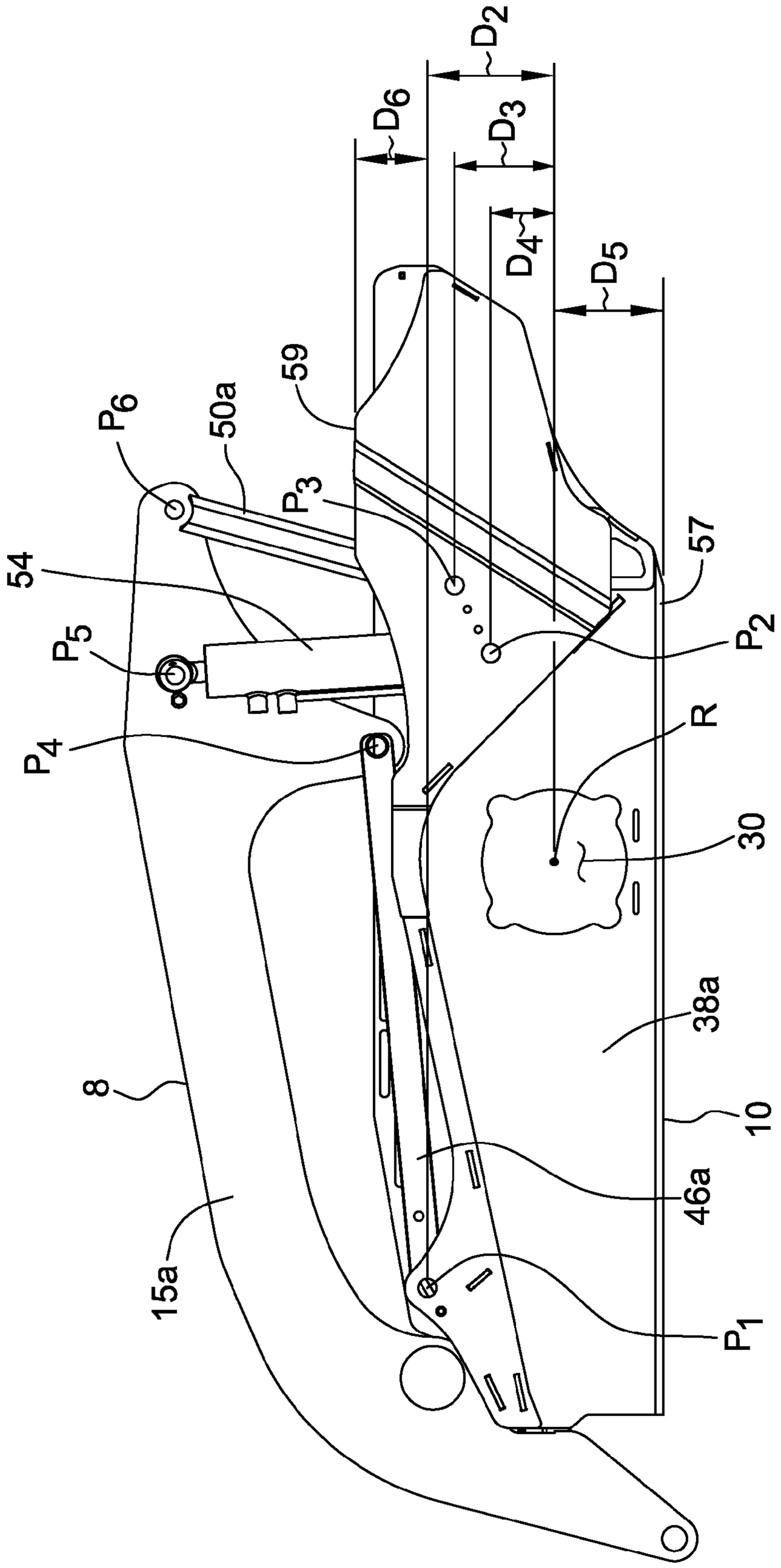


FIG. 5

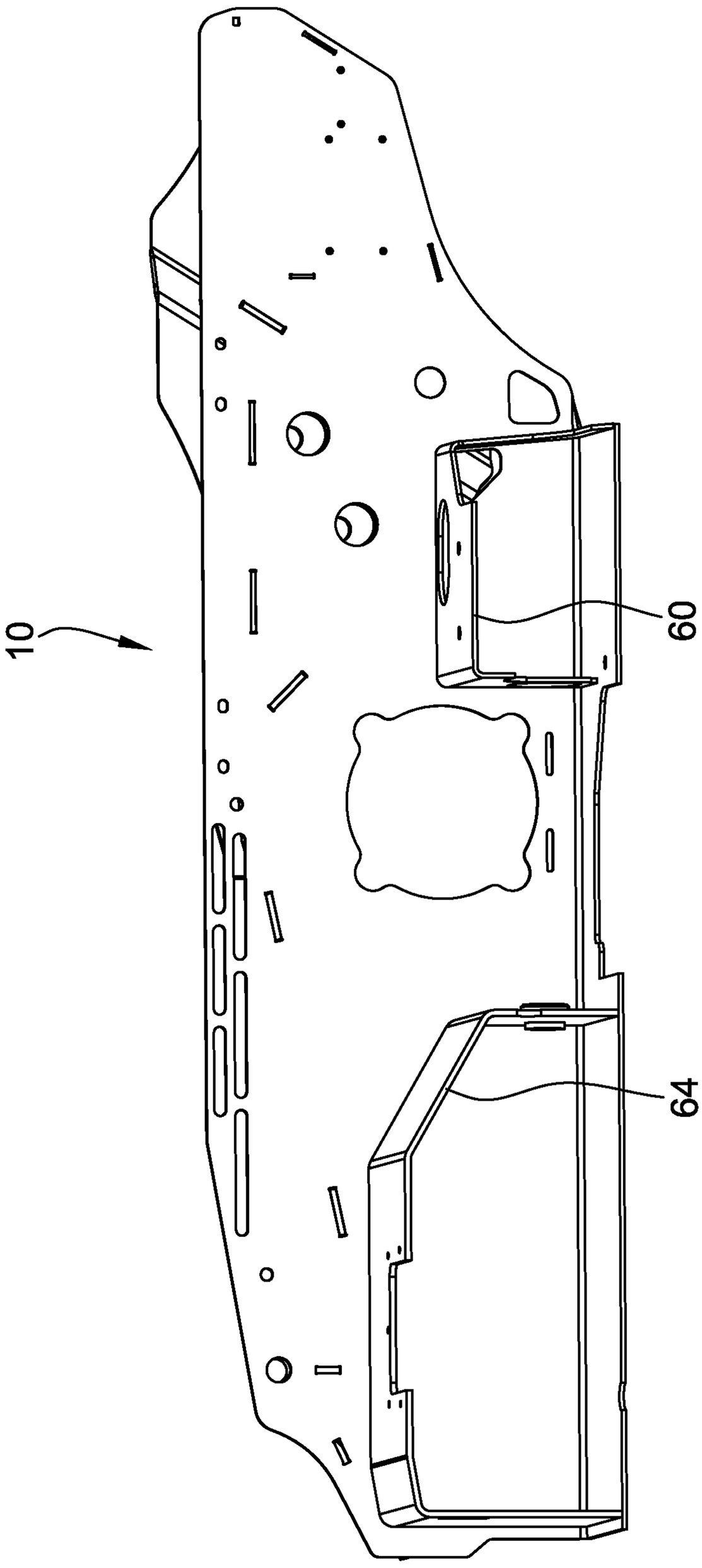


FIG. 6

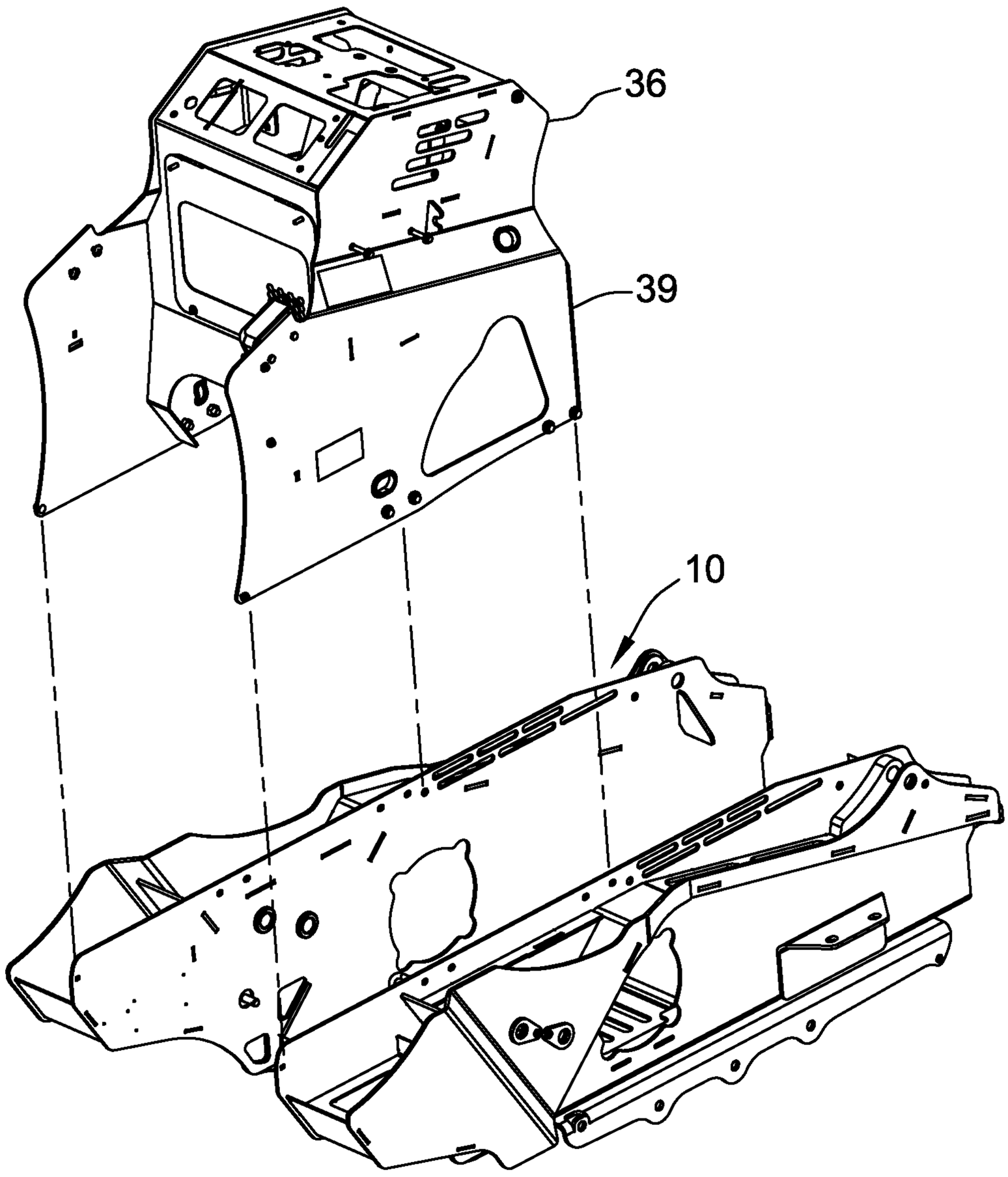


FIG. 7

LOW PROFILE COMPACT TOOL CARRIERS

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Provisional Patent Application No. 62/118,860, filed Feb. 20, 2015, which is incorporated herein by reference in its entirety.

FIELD OF THE DISCLOSURE

The field of the disclosure relates to compact tool carriers having a loader mounted to a low-profile mainframe.

BACKGROUND

Compact tool carriers are tool-mounted machines that are capable of working in tight spaces for utility or do-it-yourself home projects. Compact tool carriers are walk-behind units or include a platform on which the operator may stand during use. Compact tool carriers are generally defined (e.g., ISO 6165 (2012) and SAE J2752) as "a self-propelled crawler or wheeled machine having an operating mass of less than 1500 kg with a rigid frame, having either a pedestrian operating position or a standing operator platform at the rear of the machine and either front-mounted interchangeable equipment or lift arms with an attachment bracket capable of coupling to interchangeable, front-mounted attachments." The tool carriers may be attached to a variety of interchangeable tools such as buckets, augers, forks, stump grinders, tillers, rollers and the like.

Compact tool carriers may be distinguished from much larger conventional skid steers in which an operator is seated in the operating position. Compact tool carriers pose difficulty in design relative to full-size skid steers due to variation in weight, complexity and size.

A continuing need exists for compact tool carriers with a relatively low-profile, compact design and/or that are characterized by a more effective loader lifting profile.

This section is intended to introduce the reader to various aspects of art that may be related to various aspects of the disclosure, which are described and/or claimed below. This discussion is believed to be helpful in providing the reader with background information to facilitate a better understanding of the various aspects of the present disclosure. Accordingly, it should be understood that these statements are to be read in this light, and not as admissions of prior art.

SUMMARY

One aspect of the present disclosure is directed to a compact tool carrier configured for standing or walk-behind operator control. The carrier has a mass of less than about 1500 kg and includes a loader having an arm and a linkage pivotally attached to the loader arm. An actuator is pivotally attached to the loader arm. The carrier includes a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader. The control station is configured for remote operation or is mounted toward the rear of the compact tool carrier and is adapted to allow for standing or walk-behind operation.

Another aspect of the present disclosure is directed to a compact tool carrier. The carrier comprises a loader and a mainframe for supporting the loader. The mainframe has a first side and a second side with each side having a top and a bottom. The first side of the mainframe has at least two pivot points relative to the loader. The carrier includes a drive mechanism comprising tracks or wheels for propelling the apparatus over a supporting surface. The drive mechanism is attached to the mainframe about a rotational axis. The compact tool carrier has a bottom at which the drive mechanism contacts the supporting surface. The rotational axis and bottom of the compact tool carrier are separated by a vertical distance D1. The rotational axis and each pivot point are separated by a vertical distance. Each vertical distance between the rotational axis and a pivot point is less than 1.5 times D1.

Various refinements exist of the features noted in relation to the above-mentioned aspects of the present disclosure. Further features may also be incorporated in the above-mentioned aspects of the present disclosure as well. These refinements and additional features may exist individually or in any combination. For instance, various features discussed below in relation to any of the illustrated embodiments of the present disclosure may be incorporated into any of the above-described aspects of the present disclosure, alone or in any combination.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a compact tool carrier with the loader in a down position;

FIG. **2** is a side view of the compact tool carrier with the loader in a down position;

FIG. **3** is a side view of the compact tool carrier with the loader in a raised position;

FIG. **4** is a perspective view of a mainframe of the compact tool carrier;

FIG. **5** is a side view of the mainframe and loader of the compact tool carrier;

FIG. **6** is a cross-section side view of the mainframe; and

FIG. **7** is an exploded perspective view of the mainframe and an upper frame of the compact tool carrier.

Corresponding reference characters indicate corresponding parts throughout the drawings.

DETAILED DESCRIPTION

An embodiment of a compact tool carrier is generally referred as "**5**" in FIG. **1**. The compact tool carrier **5** includes a loader **8** supported by a mainframe **10**. The loader **8** includes an attachment plate **12** for interchangeably attaching any one of a number of tools (not shown). In this regard, such interchangeable tools do not form part of the compact tool carrier **5** unless stated otherwise. The attachment plate **12** is connected to an actuator **14** for tilting of tools connected to the attachment plate **12**. The loader **8** has a first arm **15***a* and a second arm **15***b* generally opposite the first arm **15***a*. Each arm **15***a*, **15***b* may be a single weldment or may include various components attached by fasteners (e.g., nuts and bolts). The first and second arms **15***a*, **15***b* each include a bracket portion **17***a*, **17***b* (FIG. **1**) for fastening various linkages.

As used herein, "compact tool carrier" refers to machines that are self-propelled and are capable of carrying interchangeable equipment and that generally have a mass (not including the interchangeable tool) of less than about 1500 kg (about 3307 lb). Use of the term "compact tool carrier" herein is intended to exclude full size skid steers (e.g., seat-operated units) due to a large variation in weight, complexity and size. In some embodiments, the compact tool carrier **5** meets the definition of a compact tool carrier provided in ISO 6165

(2012) and SAE J2752 set forth above, both standards being incorporated herein by reference for all relevant and consistent purposes.

The compact tool carrier **5** includes a longitudinal axis A that is parallel to the direction of travel of the carrier (i.e., parallel to its length). The compact tool carrier **5** is generally longitudinally symmetrical (i.e., relative to the longitudinal axis A) in that several components have a corresponding component with the same function opposite the component (i.e., across the axis A). Corresponding components of the pair may be indicated herein by use of a reference number followed by "A" and "B" and may be referred to as a "first" component and a "second" component, respectively. While the compact tool carrier **5** may be described herein with reference to the components of one side of the compact tool carrier **5**, any component designated by "A" or "B" herein or shown in FIGS. **1-7** includes a corresponding component with the same function opposite the component.

The compact tool carrier **5** includes a drive mechanism **18** attached to the mainframe **10**. In the illustrated embodiment, the drive mechanism **18** is directly mounted (i.e., connected without intermediary parts) to the mainframe **10** by way of drive sprocket **22** connected to a hub **26** (FIG. **2**). The hub **26** is attached to a shaft (not shown) that extends through a drive opening **30** (FIG. **4**) of the mainframe **10**. The sprocket **22**, hub **26** and shaft (not shown) rotate about a rotational axis R (FIG. **5**). As shown, the drive mechanism **18** includes tracks **34**. In other embodiments, the drive mechanism **10** includes wheels.

The compact tool carrier **5** includes a control station **36** (FIG. **1**) which may include controls (not all controls being shown) for propelling the compact tool carrier **5** forward and/or for raising and lowering the loader **8**. The control station **36** may be mounted toward the rear of the compact tool carrier **5** (i.e., opposite the attachment plate **12**) and is generally adapted to allow for standing or walk-behind operation. As used herein, "standing operation" generally refers to operation in which the operator stands on a platform attached to the compact tool carrier while "walk-behind operation" generally refers to operation in which the operator stands on the surface supporting the compact tool carrier **5**. In the illustrated embodiment, the compact tool carrier **5** includes an operator platform **37** (FIG. **2**).

In embodiments in which the compact tool carrier **5** includes an operator platform **37** for standing operation, the difference between the height of the control station **36** (e.g., as measured from the highest control for operating the loader or propelling the apparatus forward) and the platform **37** may be at least about 90 cm (e.g., from about 90 cm to about 130 cm). In embodiments in which the operator walks behind the compact tool carrier **5**, the control station **36** may be at least about 90 cm (e.g., from about 90 cm to about 130 cm) from the surface supporting the compact tool carrier. Such a range generally complies with the zones of comfort and reach for controls in earth-moving equipment set forth in ISO 6682 (2008) as determined from the physical dimensions of operators and minimum operator space envelope as set forth in ISO 3411 (2007), both of which are incorporated herein by reference for all relevant and consistent purposes.

In the illustrated embodiment, the control station **36** is attached to an upper frame **39** (FIG. **7**) that is attached and supported by the mainframe **10**. In other embodiments, rather than being integrated as one unit in the compact tool carrier **5**, the control station **36** is separate from the body (e.g., mainframe) of the carrier and is operated remotely. In such embodiments, the control station **36** may be wired or may operate wirelessly to propel the carrier **5** and/or raise and lower the loader **8**.

The mainframe **10** includes a first side **38***a* and a second side **38***b* generally opposite the first side **38***a*. As used herein, the term "mainframe" generally refers to a single weldment to which the loader **8** is attached, optionally through one or more pivotal linkages. The mainframe **10** includes bracket portions **40***a*, **40***b* (FIG. **4**) through which various pivot linkages are attached. In the illustrated embodiment, the engine (not shown) and the drive mechanism **18** comprising tracks or wheels are directly connected to the mainframe **10**.

The first loader arm **15***a* is pivotally connected to the first side **38***a* of the mainframe **10**, and the second loader arm **15***b* is pivotally connected to the second side **38***b* of the mainframe **10**. The loader arms **15***a*, **15***b* and sides **38***a*, **38***b* of the mainframe **10** each include three pivot points for pivoting the loader **8** relative to the mainframe **10**. The first side **38***a* of the mainframe **10** includes a forward pivot point P_1 (FIG. **5**) a rear pivot point P_3 and a central pivot point P_2 between the forward pivot point P_1 and the rear pivot point P_3. Similarly, the first arm **15***a* includes a forward pivot point P_4, a rear pivot point P_6 and a central pivot point P_5 between the forward pivot point P_4 and the rear pivot point P_6. The compact tool carrier **5** includes a first forward linkage **46***a* attached to the first side **38***a* of the mainframe **10** at its forward pivot point P_1 and attached to the first arm **15***a* at its forward pivot point P_4. A first rear linkage **50***a* is attached to the first side **38***a* of the mainframe **10** at its rear pivot point P_3 and is attached to the first arm **15***a* of the loader **8** at its rear pivot point P_6. While the carrier **5** is shown with two loader linkages **46***a*, **50***a* on each side of the carrier **5**, in other embodiments the carrier **5** includes a single linkage.

An actuator **54**, shown as a hydraulic cylinder, is attached to the first side **38***a* of the mainframe **10** at its center pivot point P_4 and is attached to the loader arm **15***a* at its center pivot point P_5 to raise the loader **8**. The compact tool carrier **5** may include a single actuator **54**, or, as in other embodiments, a second actuator (not shown) is connected to the second side **38***b* (FIG. **4**) of the mainframe **10** and the second arm **15***b* (FIG. **1**). The actuator **54** is powered to raise the loader **8** and, in some embodiments, is also powered to lower the loader **8** (as opposed to a one-way actuator lowered by gravity alone).

The second side **38***b* (FIG. **4**) of the mainframe **10** may include a forward pivot point and a rear pivot point to which a second forward linkage **46***b* (FIG. **1**) and second rear linkage (not shown) are respectively attached. The second arm **15***b* may also include a forward pivot point and rear pivot point to which the second forward linkage **46***b* and second rear linkage are attached. In embodiments in which the compact tool carrier **5** includes a second actuator (not shown), the second side **38***b* of the mainframe **10** includes a central pivot point between its forward pivot point and its rear pivot point, and the second arm **15***b* also includes a central pivot point between its forward pivot point and its rear pivot point. The second cylinder may be attached to the central pivot point of the second side **38***b* of the mainframe **10** and the central pivot point of the second arm **15***b*.

In some embodiments, the first and second ends **38***a*, **38***b* of the mainframe **10** and the first and second loader arms **15***a*, **15***b* do not include more than three pivot points at which the mainframe **10** and loader **8** pivot relative to each other. While the actuator **54** is shown as being attached between the other two linkages **46***a*, **50***a*, in other embodiments the actuator **54** is forward to both linkages **46***a*, **50***a* or rearward to both

linkages **46***a*, **50***a*. Further, each side of the carrier **5** having an actuator **54** may include a single linkage rather than two linkages.

In some embodiments, the mainframe **10** is characterized by a relatively low profile (i.e., the pivot points are positioned relatively low on the mainframe allowing its height to be reduced). The rotational axis R (FIG. **5**) and the bottom of the compact tool carrier **5** (FIG. **2**) are separated by a distance D**1**. Generally, the bottom of the compact tool carrier **5** corresponds to the point at which the drive mechanism **18** contacts the surface supporting the compact tool carrier **5**. The rotational axis R and the forward pivot point P_1 of the first side **38***a* of the mainframe **10** are separated by a vertical distance D**2**. The rotational axis R and the rear pivot point P_3 are separated by a vertical distance D**3**. The rotational axis R and the central pivot point P_4 are separated by a vertical distance D**4**. Each of D**2**, D**3** and D**4** is less than about 1.5 times D**1** (1.5×D**1**). In some embodiments, each of D**2**, D**3** and D**4** is less than D**1** or even less than about 0.75 times D**1** (0.75×D**1**).

The mainframe **10** profile may also be expressed relative to the distance D**5** between the rotational axis R (FIG. **5**) and the bottom **57** of the mainframe **10**. Each of D**2**, D**3** and D**4** is less than about twice D**5** (2×D**5**). In some embodiments, each of D**2**, D**3** and D**4** is less than about 1.75 times D**5** (1.75×D**5**) or less than about 1.5 times D**5** (1.5×D**5**). P**2** and P**3** may be relatively lower than P**1** and their distances D**3**, D**4** from the rotational axis R may be even less than about 1.25 times D**5** (1.25×D**5**). The distance D**6** between the top **59** of the first side **38***a* of the mainframe **10** and the highest pivot point (P_1 in the illustrated embodiment), is less than about 1.5 times D**5**, less than about D**5** or less than about 0.75 times D**5**.

The second side **38***b* (FIG. **1**) of the mainframe **10** may have a similar pivot point arrangement. The rotational axis R and the forward pivot point of the second side **38***b* are separated by a vertical distance D**2'** (not shown). The rotational axis R and the rear pivot point of the second side are separated by a vertical distance D**3'** (not shown). The rotational axis R and the central pivot point (if any) of the second side **38***b* of mainframe **10** are separated by a vertical distance D**4'** (not shown). Each of D**2'**, D**3'** and D**4'** is less than about 1.5 times D**1** (1.5×D**1**) or less than D**1** or even less than about 0.75 times D**1** (0.75×D**1**). The rotational axis R and the bottom of the second side **38***b* of the mainframe **10** are separated by a vertical distance D**5'** (not shown). Each of D**2'**, D**3'** and D**4'** is less than twice D**5'** (2×D**5'**) or less than about 1.75 times D**5'** (1.75×D**5'**) or less than about 1.5 times D**5'** (1.5×D**5'**). D**3'** and D**4'** may be even less than about 1.25 times D**5'** (1.25×D**5'**). The distance D**6'** between the top of the second side **38***b* of the mainframe **10** and the highest pivot point is less than about 1.5 times D**5'**, less than about D**5'** or less than about 0.75 times D**5'**.

The compact tool carrier **5** includes an engine (not shown) for propelling the drive mechanism **18**. As shown in FIG. **6**, the engine may be mounted to an engine bracket **60** that forms part of the mainframe **10**. The engine may drive a hydraulic pump that powers hydraulic motors (not shown) which drive the drive mechanism **18** (FIG. **1**) and which provide hydraulic power to actuator **54**. The mainframe **10** includes a reservoir **64** for storing and cycling of hydraulic fluid.

Compared to conventional compact tool carriers, embodiments of the compact tool carrier **5** described above have several advantages. By positioning the pivot points relatively low on the mainframe **10**, the mass of the mainframe **10** and the resulting cost of the carrier **5** may be reduced. Further, such a low-profile mainframe **10** improves visibility for the operator and allows the center of gravity of the carrier **5** to be lowered which improves its stability. In embodiments in which the carrier **5** includes an actuator **54** (FIG. **5**) for lifting the loader **8** that is disposed between forward linkage **46***a* and a rear linkage **50***a* on at least one side **38***a*, **38***b* of the mainframe **10**, the loader **8** is characterized by an travel path in which the loader travels vertically rather than over a radial path. The vertical travel path of the loader **8** is more effective relative to conventional travel paths for compact tool carriers **5** as the carrier **5** may operate closer to other structures.

As used herein, the terms "about," "substantially," "essentially" and "approximately" when used in conjunction with ranges of dimensions, concentrations, temperatures or other physical or chemical properties or characteristics is meant to cover variations that may exist in the upper and/or lower limits of the ranges of the properties or characteristics, including, for example, variations resulting from rounding, measurement methodology or other statistical variation.

When introducing elements of the present disclosure or the embodiment(s) thereof, the articles "a", "an", "the" and "said" are intended to mean that there are one or more of the elements. The terms "comprising," "including," "containing" and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements. The use of terms indicating a particular orientation (e.g., "top", "bottom", "side", etc.) is for convenience of description and does not require any particular orientation of the item described.

As various changes could be made in the above constructions and methods without departing from the scope of the disclosure, it is intended that all matter contained in the above description and shown in the accompanying drawing[s] shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an arm, the loader being adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe, the loader arm not being directly attached to the mainframe;

a linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;

an actuator pivotally attached to the first side of the mainframe and pivotally attached to the loader arm; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation.

2. The compact tool carrier as set forth in claim **1** wherein the mainframe incorporates a single weldment.

3. The compact tool carrier as set forth in claim **1** wherein the loader arm is a first loader arm and the linkage is a first linkage, the loader comprising a second loader arm and the compact tool carrier comprising a second linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

4. The compact tool carrier as set forth in claim **3** wherein the actuator is a first actuator, the compact tool carrier comprising a second actuator, the second actuator being pivotally

attached to the second side of the mainframe and pivotally attached to the second loader arm.

5. The compact tool carrier as set forth in claim **1** comprising a drive mechanism comprising tracks or wheels, the drive mechanism being attached to the mainframe.

6. The compact tool carrier as set forth in claim **1** comprising an engine to propel a drive mechanism, the engine being attached to the engine bracket.

7. The compact tool carrier as set forth in claim **1** wherein the actuator is a hydraulic cylinder.

8. The compact tool carrier as set forth in claim **1** wherein each loader arm incorporates a single weldment.

9. The compact tool carrier as set forth in claim **1** wherein the control station is mounted toward the rear of the compact tool carrier, the compact tool carrier comprising an operator platform for standing operation of the compact tool carrier, the difference between the height of the control station and the height of the platform being at least 90 cm.

10. The compact tool carrier as set forth in claim **1** wherein the control station is mounted toward the rear of the compact tool carrier, and the height of the control station from a surface supporting the compact tool carrier is at least 90 cm.

11. A method for operating the compact tool carrier as set forth in claim **1**, the method comprising standing behind the compact tool carrier and operating the control station to propel the compact tool carrier forward and/or raise or lower the loader.

12. The method as set forth in claim **11** wherein the control station is operated while standing on an operator platform or while standing on a surface supporting the compact tool carrier.

13. The compact tool carrier as set forth in claim **1** further comprising a tool attached to the loader, the tool being selected from the group consisting of a bucket, auger, fork, stump grinder, tiller and roller.

14. The compact tool carrier as set forth in claim **1** wherein a single linkage is attached to the first side of the mainframe and pivotally attached to the loader arm.

15. A compact tool carrier comprising:

a loader adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe, each side having a top and a bottom, the first side of the mainframe having at least two pivot points relative to the loader, the loader not being directly attached to the mainframe;

a linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader;

an actuator pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader;

a drive mechanism comprising tracks or wheels for propelling the compact tool carrier over a supporting surface, the drive mechanism being attached to the mainframe about a rotational axis, the compact tool carrier having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis and bottom of the compact tool carrier being separated by a vertical distance D**1**, the rotational axis and each pivot point being separated by a vertical distance, each vertical distance between the rotational axis and a pivot point being less than 1.5 times D**1**; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and/or lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation.

16. The compact tool carrier as set forth in claim **15** wherein the rotational axis and the pivot point at which the linkage is attached are separated by a vertical distance D**2**, the rotational axis and the pivot point at which the actuator is attached are separated by a vertical distance D**3**, both D**2** and D**3** being less than 1.5 times D**1**.

17. The compact tool carrier as set forth in claim **16** wherein the second side of the mainframe comprises two pivot points, each vertical distance between the rotational axis and a pivot point being less than 1.5 times D**1**.

18. The compact tool carrier as set forth in claim **16** wherein the rotational axis and the bottom of the first side of the mainframe are separated by a vertical distance D**5**, both D**2** and D**3** being less than twice D**5**.

19. The compact tool carrier as set forth in claim **18** wherein the first side of the mainframe comprises a top most pivot point, the top most pivot point and the top of the first side of the mainframe being separated by a vertical distance D**6**, D**6** being less than about 1.5 times D**5**.

20. The compact tool carrier as set forth in claim **15** further comprising a tool attached to the loader, the tool being selected from the group consisting of a bucket, auger, fork, stump grinder, tiller and roller.

* * * * *

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(12) EX PARTE REEXAMINATION CERTIFICATE (11288th)

United States Patent

Thomas et al.

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(54) LOW PROFILE COMPACT TOOL CARRIERS

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E02F 9/20	(2006.01)
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B66F 9/065	(2006.01)

(52) **U.S. Cl.**
CPC ***B66F 9/06*** (2013.01); ***B60P 1/483*** (2013.01); ***B66F 9/065*** (2013.01); ***B66F 9/0759*** (2013.01); ***B66F 9/07572*** (2013.01); ***B66F 9/07577*** (2013.01); ***B66F 9/22*** (2013.01); ***E02F 3/3405*** (2013.01); ***E02F 3/3414*** (2013.01); ***E02F 3/96*** (2013.01); ***E02F 9/08*** (2013.01); ***E02F 9/205*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

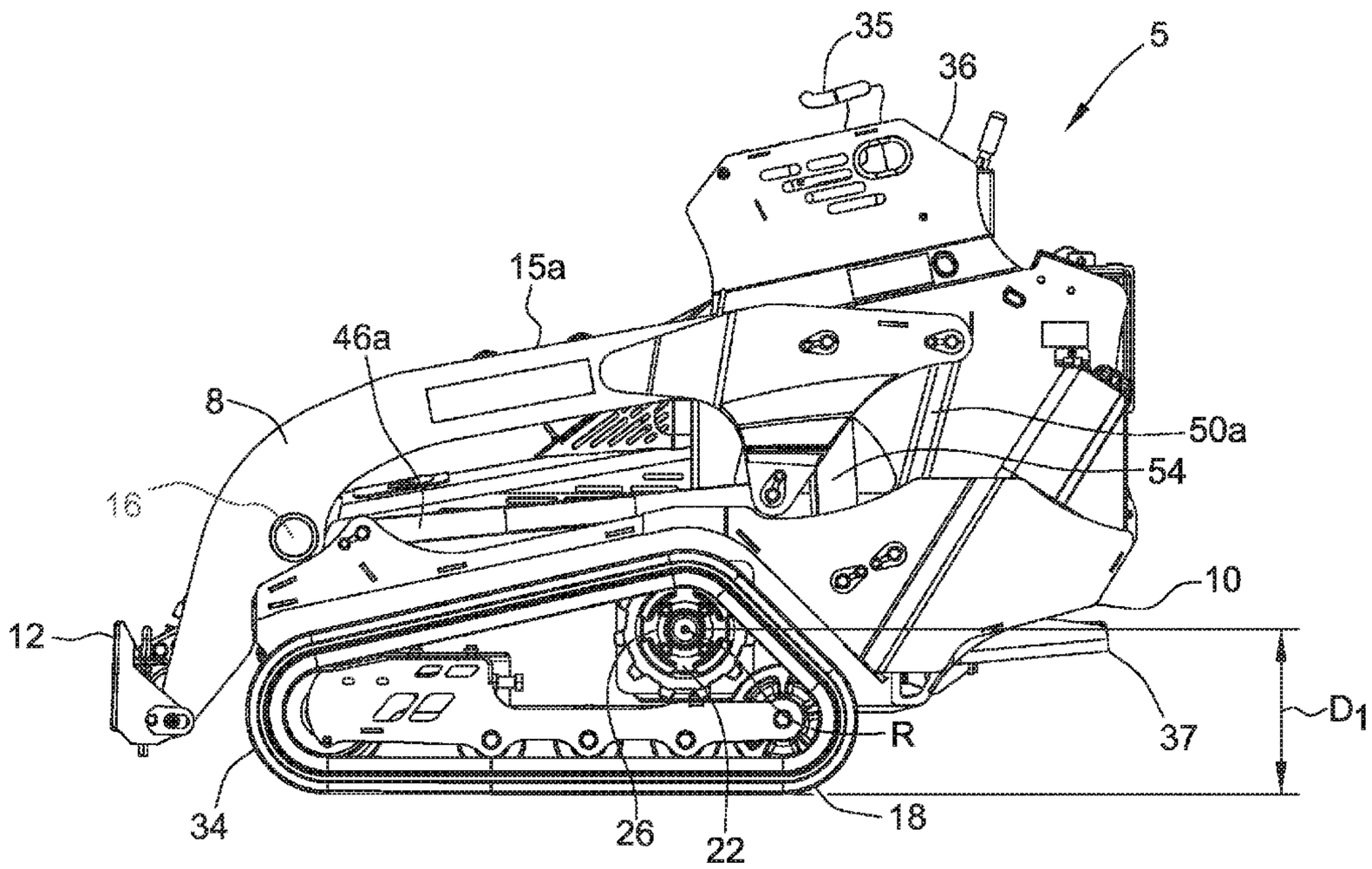
(56) **References Cited**

To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/013,915, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner — William Doerrler

(57) **ABSTRACT**

Compact tool carriers having a loader mounted to a low-profile mainframe are disclosed. In some embodiments, the pivot points of the mainframe about which the loader is pivoted are low relative to the mainframe to reduce the mainframe size and to lower the center of gravity to improve the stability of the compact tool carrier during use.



(AMENDED)

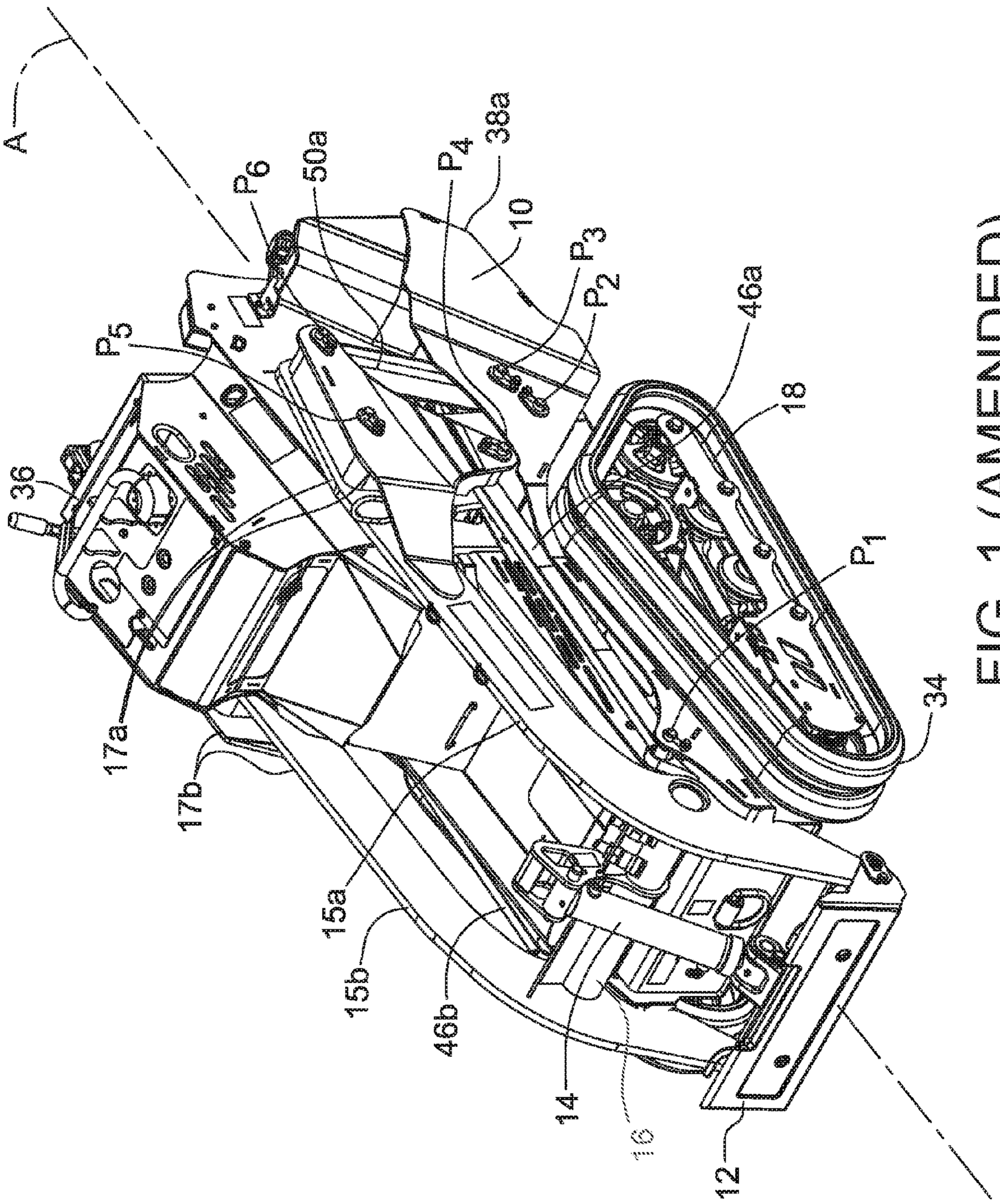


FIG. 1 (AMENDED)

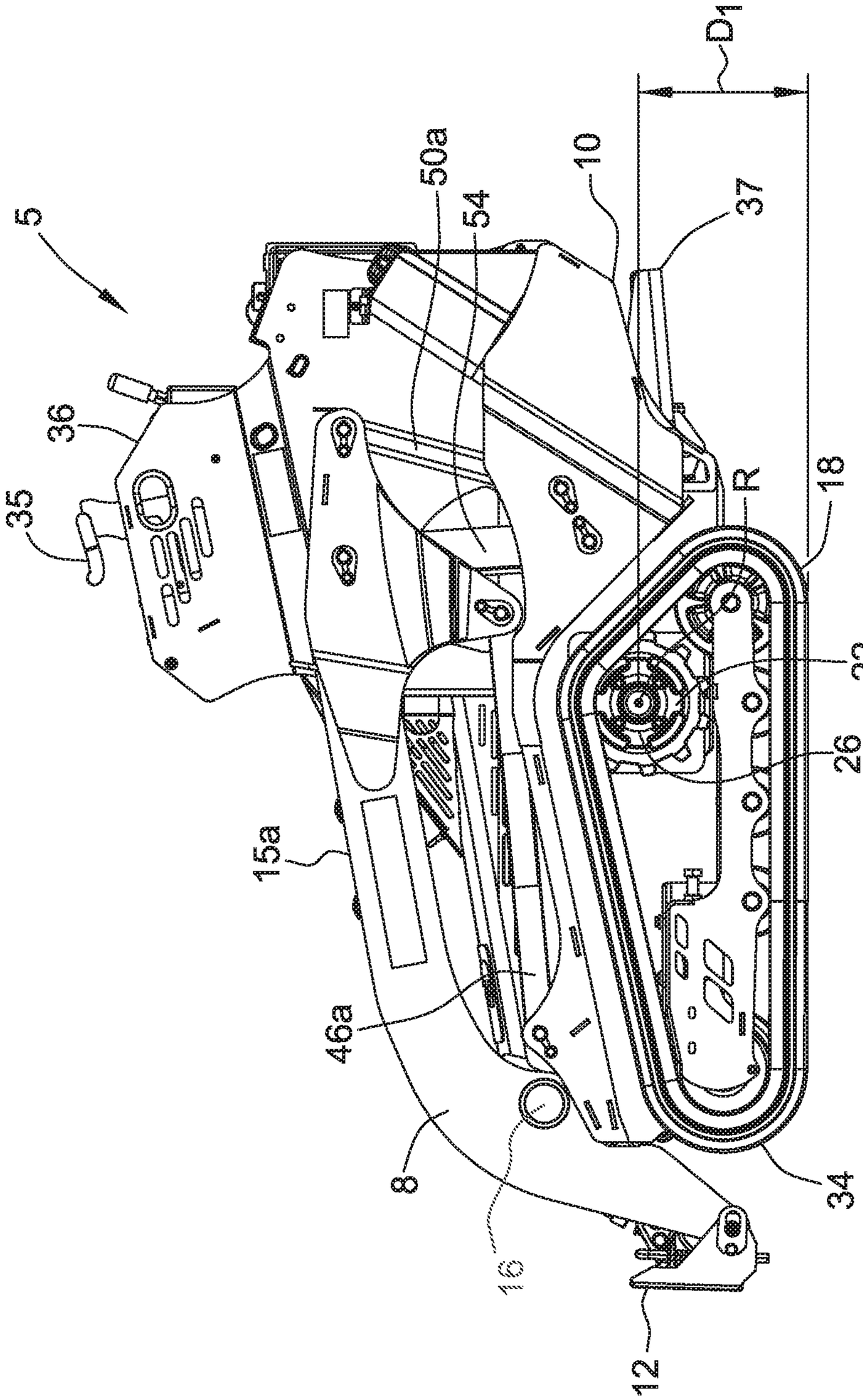


FIG. 2 (AMENDED)

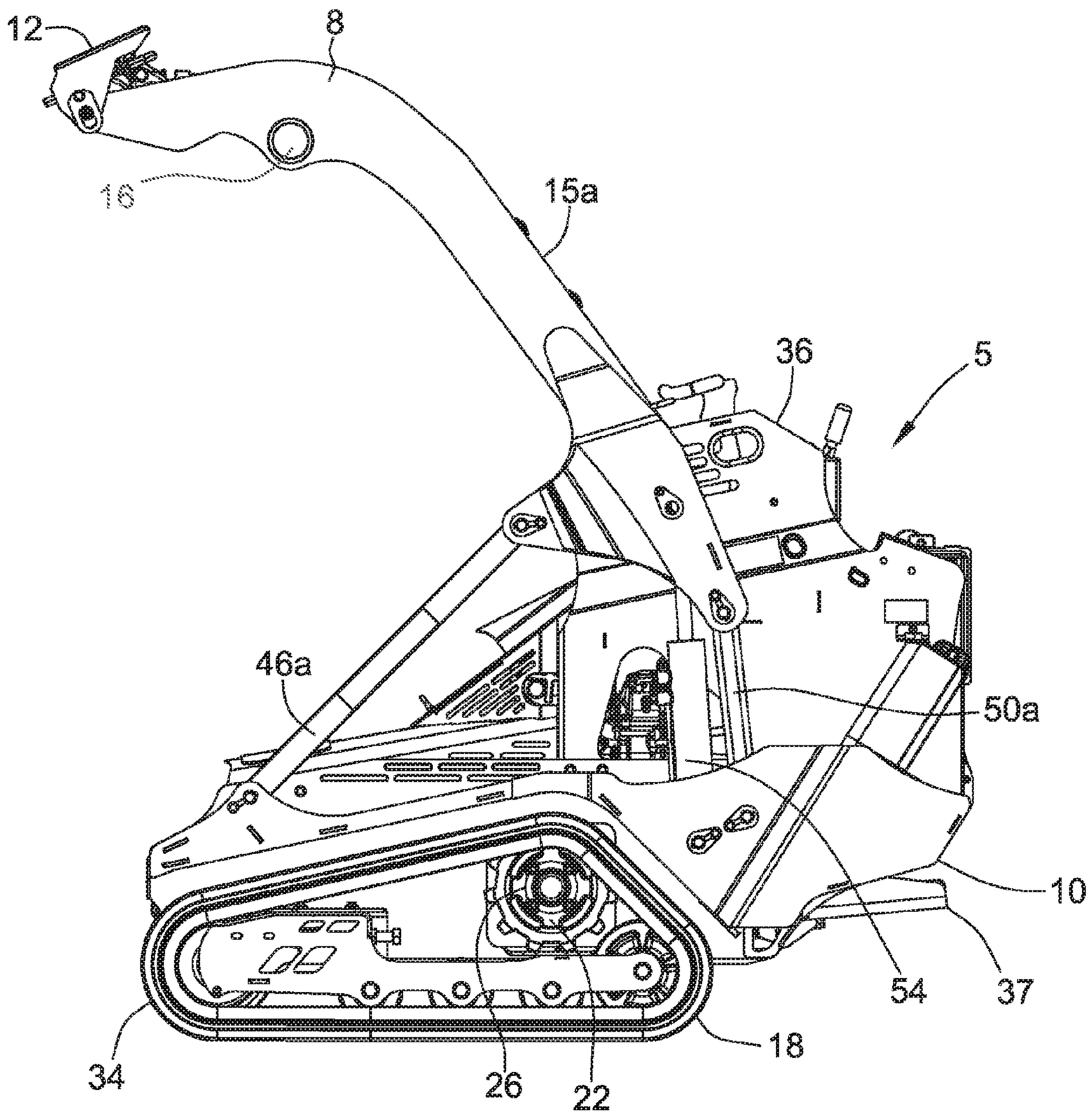


FIG. 3 (AMENDED)

EX PARTE REEXAMINATION CERTIFICATE

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

ONLY THOSE PARAGRAPHS OF THE SPECIFICATION AFFECTED BY AMENDMENT ARE PRINTED HEREIN.

Column 2, lines 44-58:

An embodiment of a compact tool carrier is generally referred as "**5**" in FIG. **1**. The compact tool carrier **5** includes a loader **8** supported by a mainframe **10**. The loader **8** includes an attachment plate **12** for interchangeably attaching any one of a number of tools (not shown). In this regard, such interchangeable tools do not form part of the compact tool carrier **5** unless stated otherwise. The attachment plate **12** is connected to an actuator **14** for tilting of tools connected to the attachment plate **12**. The loader **8** has a first arm **15***a* and a second arm **15***b* generally opposite the first arm **15***a*. *A cross-member 16 extends from the first arm 15a to the second arm 15b. The actuator 14 is connected to the cross-member 16.* Each arm **15***a*, **15***b* may be a single weldment or may include various components attached by fasteners (e.g., nuts and bolts). The first and second arms **15***a*, **15***b* each include a bracket portion **17***a*, **17***b* (FIG. **1**) for fastening various linkages.

Column 3, lines 20-30:

The compact tool carrier **5** includes a drive mechanism **18** attached to the mainframe **10**. In the illustrated embodiment, the drive mechanism **18** is directly mounted (i.e., connected without intermediary parts) to the mainframe **10** by way of drive sprocket **22** connected to a hub **26** (FIG. **2**). The hub **26** is attached to a shaft (not shown) that extends through a drive opening **30** (FIG. **4**) of the mainframe **10**. The sprocket **22**, hub **26** and shaft (not shown) rotate about a rotational axis R (FIG. **5**). As shown, the drive mechanism **18** includes tracks **34**. In other embodiments, the drive mechanism **[10]** *18* includes wheels.

Column 4, lines 35-45:

An actuator **54**, shown as a hydraulic cylinder, is attached to the first side **38***a* of the mainframe **10** at its center pivot point **[**P_4**]** P_2 and is attached to the loader arm **15***a* at its center pivot point P_5 to raise the loader **8**. The compact tool carrier **5** may include a single actuator **54**, or, as in other embodiments, a second actuator (not shown) is connected to the second side **38***b* (FIG. **4**) of the mainframe **10** and the second arm **15***b* (FIG. **1**). The actuator **54** is powered to raise the loader **8** and, in some embodiments, is also powered to lower the loader **8** (as opposed to a one-way actuator lowered by gravity alone).

Column 5, lines 4-19:

In some embodiments, the mainframe **10** is characterized by a relatively low profile (i.e., the pivot points are positioned relatively low on the mainframe allowing its height to be reduced). The rotational axis R (FIG. **5**) and the bottom of the compact tool carrier **5** (FIG. **2**) are separated by a distance D**1**. Generally, the bottom of the compact tool carrier **5** corresponds to the point at which the drive mechanism **18** contacts the surface supporting the compact tool carrier **5**. The rotational axis R and the forward pivot point P_1 of the first side **38***a* of the mainframe **10** are separated by a vertical distance D**2**. The rotational axis R and the rear pivot point P_3 are separated by a vertical distance D**3**. The rotational axis R and the central pivot point **[**P_4**]** P_2 are separated by a vertical distance D**4**. Each of D**2**, D**3** and D**4** is less than about 1.5 times D**1** (1.5×D**1**). In some embodiments, each of D**2**, D**3** and D**4** is less than D**1** or even less than about 0.75 times D**1** (0.75×D**1**).

THE DRAWING FIGURES HAVE BEEN CHANGED AS FOLLOWS:

On FIGS. **1**, **2** and **3**, A reference numeral has been added (**16**) for the crossbar between the arms (**15**a and **15**b).

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims **1** and **3-13** is confirmed.

Claims **16** and **18** are cancelled.

Claims **15**, **17** and **19** are determined to be patentable as amended.

Claim **20**, dependent on an amended claim, is determined to be patentable.

New claims **21-63** are added and determined to be patentable.

Claims **2** and **14** were not reexamined.

15. A compact tool carrier comprising:

a loader adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe, each side having a top and a bottom, the first side of the mainframe having at least two pivot points relative to the loader, the loader not being directly attached to the mainframe;

a linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader;

an actuator pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader;

a drive mechanism comprising tracks or wheels for propelling the compact tool carrier over a supporting surface, the drive mechanism being attached to the mainframe about a rotational axis, the compact tool carrier having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis and bottom of the compact tool carrier being separated by a vertical distance D**1**, *the rotational axis and the bottom of the first side of the mainframe being separated by a vertical distance D5,* the rotational axis and **[**each**]** *the* pivot point *at which the linkage is attached to the mainframe* being separated by a vertical distance *D2, the rotational axis and the pivot point at which the*

actuator is attached to the mainframe being separated by a vertical distance D4, [each vertical distance between the rotational axis and a pivot point] *D2 and D4 each* being less than 1.5 times D1 *and each being less than twice D5*; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and/or lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation.

17. The compact tool carrier as set forth in claim **[16]** *15* wherein the second side of the mainframe comprises two pivot points, each vertical distance between the rotational axis and a pivot point being less than 1.5 times D**1**.

19. The compact tool carrier as set forth in claim **[18]** *15* wherein the first side of the mainframe comprises a top most pivot point, the top most pivot point and the top of the first side of the mainframe being separated by a vertical distance D**6**, D**6** being less than about 1.5 times D**5**.

21. The compact tool carrier as set forth in claim 1 wherein the linkage is a first linkage, the first linkage being pivotally attached to the first side of the mainframe at a first pivot point and pivotally attached to the loader arm at a second pivot point, the actuator being attached to the mainframe at a third pivot point and pivotally attached to the loader arm at a fourth pivot point, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a fifth pivot point and pivotally attached to the loader arm at a sixth pivot point, wherein as the loader travels from a down position to a vertically raised position, the first, second, third, fourth, fifth, and sixth pivot points are (1) disposed between the operator controls and a bottom of the mainframe and/or (2) disposed forward of the control station.

22. The compact tool carrier as set forth in claim 21 further comprising an operator platform for standing operation of the operator controls of the control station, the operator platform being located toward a rear of the compact tool carrier such that the first pivot point, third pivot point, and fifth pivot point are disposed forward of the operator platform.

23. The compact tool carrier as set forth in claim 15 wherein D2 and D4 are each less than 1.75 D5.

24. The compact tool carrier as set forth in claim 15 wherein D2 and D4 are each less than 1.5 D5.

25. The compact tool carrier as set forth in claim 15 wherein D2 and D4 are each less than D1.

26. The compact tool carrier as set forth in claim 15 wherein D2 and D4 are each less than 0.75 D1.

27. The compact tool carrier as set forth in claim 15 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, the rotational axis and the pivot point at which the second linkage is attached to the mainframe being separated by a vertical distance D3, D3 being less than 1.5 times D1.

28. The compact tool carrier as set forth in claim 15 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, wherein the mainframe comprises a forward-most pivot point with (1) the pivot point at which the first linkage is attached to the mainframe, (2) the pivot point at which the actuator is attached to the mainframe, or (3) the pivot point at which the second linkage is attached to the mainframe being the forward-most pivot point, a vertical distance between the rotational axis and the forward-most pivot point being less than D1.

29. The compact tool carrier as set forth in claim 15 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, wherein the mainframe comprises a forward-most pivot point with (1) the pivot point at which the first linkage is attached to the mainframe, (2) the pivot point at which the actuator is attached to the mainframe, or (3) the pivot point at which the second linkage is attached to the mainframe being the forward-most pivot point, a vertical distance between the rotational axis and the forward-most pivot point being less than 0.75 D1.

30. The compact tool carrier as set forth in claim 15 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, wherein the mainframe comprises a forward-most pivot point with (1) the pivot point at which the first linkage is attached to the mainframe, (2) the pivot point at which the actuator is attached to the mainframe, or (3) the pivot point at which the second linkage is attached to the mainframe being the forward-most pivot point, a vertical distance between the rotational axis and the forward-most pivot point being less than 1.5 D5.

31. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader adapted to carry a tool, the loader being moveable between a down position and a vertically raised position, the loader comprising:

a first loader arm;

a second loader arm; and

at least one cross-member that extends from the first loader arm to the second loader arm;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe, the first loader arm not being directly attached to the mainframe;

a linkage pivotally attached to the first side of the mainframe and pivotally attached to the first loader arm;

an actuator pivotally attached to the first side of the mainframe and pivotally attached to the first loader arm;

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing operation, each cross-member being disposed forward of the control station in the vertically raised position of the loader; and

an operator platform for standing operation of the operator controls of the control station.

32. The compact tool carrier as set forth in claim 31 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe and pivotally attached to the first loader arm.

33. The compact tool carrier as set forth in claim 31 wherein the mainframe incorporates a single weldment.

34. The compact tool carrier as set forth in claim 31 wherein each cross-member is disposed forward of the operator platform and forward of the control station in the down position of the loader.

35. The compact tool carrier as set forth in claim 31 further comprising an attachment plate for removably attaching a tool to the compact tool carrier, the cross-member being spaced from the attachment plate.

36. The compact tool carrier as set forth in claim 35 further comprising an actuator for tilting of tools connected to the attachment plate, the actuator being connected to the cross-member and the attachment plate.

37. The compact tool carrier as set forth in claim 31 further comprising a drive mechanism for propelling the compact tool carrier over a supporting surface, the drive mechanism having a drive sprocket, the cross-member being disposed forward of the drive sprocket in the vertically raised position and the down position.

38. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader being adapted to carry a tool, the loader comprising:

a first loader arm;

a second loader arm; and

a single cross-member that extends from the first loader arm to the second loader arm;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear of the mainframe, the first loader arm not being directly attached to the mainframe;

a linkage pivotally attached to the first side of the mainframe and pivotally attached to the first loader arm;

an actuator pivotally attached to the first side of the mainframe and pivotally attached to the first loader arm;

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing operation; and

an operator platform for standing operation of the operator controls of the control station.

39. The compact tool carrier as set forth in claim 38 wherein the loader is moveable between a down position and a vertically raised position, the cross-member being disposed forward of the operator platform in the down position and the vertically raised position of the loader.

40. The compact tool carrier as set forth in claim 38 wherein the loader is moveable between a down position and a vertically raised position, the compact tool carrier further comprising a drive mechanism for propelling the compact tool carrier over a supporting surface, the drive mechanism having a drive sprocket, the cross-member being disposed forward of the drive sprocket in the down position and the vertically raised position of the loader.

41. The compact tool carrier as set forth in claim 38 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe and pivotally attached to the first loader arm.

42. The compact tool carrier as set forth in claim 38 wherein the mainframe incorporates a single weldment.

43. The compact tool carrier as set forth in claim 38 further comprising an attachment plate for removably attaching a tool to the compact tool carrier, the cross-member being spaced from the attachment plate.

44. The compact tool carrier as set forth in claim 43 further comprising an actuator for tilting of tools connected to the attachment plate, the actuator being connected to the cross-member and the attachment plate.

45. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an arm, the loader being adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear of the mainframe, the loader arm not being directly attached to the mainframe;

a first linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm at a first linkage pivot point;

a second linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm at a second linkage pivot point, the loader being free of cross-members between the first linkage pivot point and the second linkage pivot point;

an actuator pivotally attached to the first side of the mainframe and pivotally attached to the loader arm at an actuator pivot point;

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation; and

an operator platform for standing operation of the operator controls of the control station.

46. The compact tool carrier as set forth in claim 45 wherein the loader comprises:

a first arm;

a second arm; and

a cross-member that extends from the first arm to the second arm, the cross-member being disposed forward of the first linkage pivot point, the second linkage pivot point, and the actuator pivot point.

47. The compact tool carrier as set forth in claim 46 further comprising an attachment plate for removably attaching a tool to the compact tool carrier, the cross-member being spaced from the attachment plate.

48. The compact tool carrier as set forth in claim 47 further comprising an actuator for tilting of tools connected to the attachment plate, the actuator being connected to the cross-member and the attachment plate.

49. The compact tool carrier as set forth in claim 45 wherein the mainframe incorporates a single weldment.

50. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader adapted to carry a tool, the loader comprising:

a first loader arm;

a second loader arm; and

at least one cross-member that extends from the first loader arm to the second loader arm;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe, the first loader arm not being directly attached to the mainframe;

a first linkage pivotally attached to the first side of the mainframe and pivotally attached to the first loader arm at a first linkage pivot point;

a second linkage pivotally attached to the first side of the mainframe and pivotally attached to the first loader arm at a second linkage pivot point, each cross-member being disposed forward of the first linkage pivot point and the second linkage pivot point;

an actuator pivotally attached to the first side of the mainframe and pivotally attached to the first loader arm at an actuator pivot point;

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation; and

an operator platform for standing operation of the operator controls of the control station.

51. The compact tool carrier as set forth in claim 50 wherein each cross-member is disposed forward of the actuator pivot point.

52. The compact tool carrier as set forth in claim 50 wherein the mainframe incorporates a single weldment.

53. The compact tool carrier as set forth in claim 50 further comprising an attachment plate for removably attaching a tool to the compact tool carrier, the cross-member being spaced from the attachment plate.

54. The compact tool carrier as set forth in claim 53 further comprising an actuator for tilting of tools connected to the attachment plate, the actuator being connected to the cross-member and the attachment plate.

55. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an arm, the loader being adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe, each side having a top and a bottom, the first side of the mainframe having at least two pivot points relative to the loader, the loader arm not being directly attached to the mainframe;

a linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;

an actuator pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;

a drive mechanism comprising tracks for propelling the compact tool carrier over a supporting surface, the drive mechanism having a rotational axis, the compact tool carrier having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis and bottom of the compact tool carrier being separated by a vertical distance D1, the rotational axis and the bottom of the first side of the mainframe being separated by a vertical distance D5, the rotational axis and the pivot point at which the linkage is attached to the mainframe being separated by a vertical distance D2, the rotational axis and the pivot point at which the actuator is attached to the mainframe being separated by a vertical distance D4, both D2 and D4 being less than D1 and being less than 1.5 D5; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation.

56. The compact tool carrier as set forth in claim 55 wherein D2 and D4 are each less than 0.75 D1.

57. The compact tool carrier as set forth in claim 55 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, the rotational axis and the pivot point at which the second linkage is attached to the mainframe being separated by a vertical distance D3, D3 being less than 1.5 times D1.

58. The compact tool carrier as set forth in claim 55 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, wherein the mainframe comprises a forward-most pivot point with (1) the pivot point at which the first linkage is attached to the mainframe, (2) the pivot point at which the actuator is attached to the mainframe, or (3) the pivot point at which the second linkage is attached to the mainframe being the forward-most pivot point, a vertical distance between the rotational axis and the forward-most pivot point being less than D1.

59. The compact tool carrier as set forth in claim 55 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, wherein the mainframe comprises a forward-most pivot point with (1) the pivot point at which the first linkage is attached to the mainframe, (2) the pivot point at which the actuator is attached to the mainframe, or (3) the pivot point at which the second linkage is attached to the mainframe being the forward-most pivot point, a vertical distance between the rotational axis and the forward-most pivot point being less than 0.75 D1.

60. The compact tool carrier as set forth in claim 55 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, wherein the mainframe comprises a forward-most pivot point with (1) the pivot point at which the first linkage is attached to the mainframe, (2) the pivot point at which the actuator is attached to the mainframe, or (3) the pivot point at which the second linkage is attached to the mainframe being the forward-most pivot point, a vertical distance between the rotational axis and the forward-most pivot point being less than 0.75 D5.

61. The compact tool carrier as set forth in claim 55 wherein the drive mechanism comprises a drive sprocket, the drive sprocket rotating about the rotational axis.

62. The compact tool carrier as set forth in claim 55 further comprising an operator platform for standing operation of the operator controls of the control station.

63. The compact tool carrier as set forth in claim 55 wherein the mainframe incorporates a single weldment.

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(12) **EX PARTE REEXAMINATION CERTIFICATE** (11629th)

United States Patent
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(54) **LOW PROFILE COMPACT TOOL CARRIERS**

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CPC ***B66F 9/065*** (2013.01); ***B60P 1/483*** (2013.01); ***B66F 9/0759*** (2013.01); ***B66F 9/07572*** (2013.01); ***B66F 9/22*** (2013.01); ***E02F 3/3405*** (2013.01); ***E02F 3/96*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

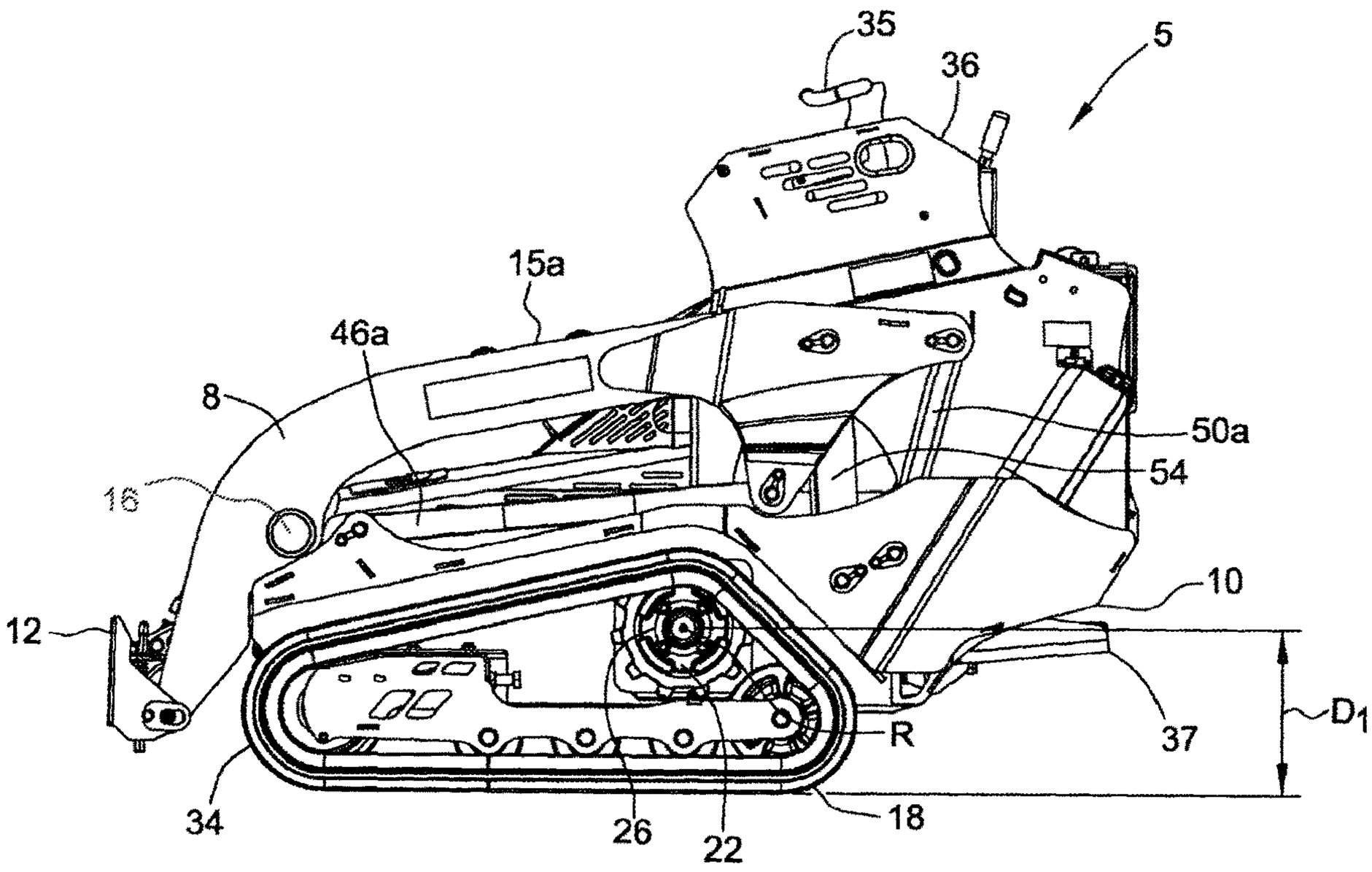
(56) **References Cited**

To view the complete listing of prior art documents cited during the proceesings for Reexamination Control Numbers 90/014,109 and 90/014,124, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner — Russell D Stormer

(57) **ABSTRACT**

Compact tool carriers having a loader mounted to a low-profile mainframe are disclosed. In some embodiments, the pivot points of the mainframe about which the loader is pivoted are low relative to the mainframe to reduce the mainframe size and to lower the center of gravity to improve the stability of the compact tool carrier during use.



EX PARTE REEXAMINATION CERTIFICATE

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims **1-13**, **15**, **17**, **20**, **22-45** and **49-63** is confirmed.

Claims **16** and **18** were previously cancelled.

Claims **21** and **46** are determined to be patentable as amended.

Claims **47** and **48**, dependent on an amended claim, are determined to be patentable.

New claims **64-87** are added and determined to be patentable.

Claims **14** and **19** were not reexamined.

21. The compact tool carrier as set forth in claim **1** wherein the linkage is a first linkage, the first linkage being pivotally attached to the first side of the mainframe at a first pivot point and pivotally attached to the loader arm at a second pivot point, the actuator being attached to the mainframe at a third pivot point and pivotally attached to the loader arm at a fourth pivot point, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a fifth pivot point and pivotally attached to the loader arm at a sixth pivot point, wherein as the loader travels from a down position to a vertically raised position, the first, second, third, fourth, fifth, and sixth pivot points are (1) disposed between the operator controls and a bottom of the mainframe **[**and/or**]** *or* (2) disposed forward of the control station.

46. The compact tool carrier as set forth in claim **45** wherein the loader comprises:

a first arm;

a second arm; and

a cross-member that extends from the first arm to the second arm, the cross-member being *fully* disposed forward of the first linkage pivot point, the second linkage pivot point, and the actuator pivot point.

64. The compact tool carrier as set forth in claim 1 further comprising an operator platform for standing operation of the operator controls of the control station, the operator platform extending from the mainframe.

65. The compact tool carrier as set forth in claim 64 wherein least a portion of the operator platform is forward of the rear end of the mainframe.

66. The compact tool carrier as set forth in claim 15 wherein the pivot point at which the actuator is attached to the first side of the mainframe is above the rotational axis.

67. The compact tool carrier as set forth in claim 15 wherein the pivot point at which the linkage is attached to the first side of the mainframe is disposed above the tracks or wheels.

68. The compact tool carrier as set forth in claim 55 wherein the drive mechanism further comprises a drive sprocket, the drive sprocket rotating about the rotational axis, and the pivot point at which the actuator is attached to the first side of the mainframe being above the rotational axis.

69. The compact tool carrier as set forth in claim 55 wherein the pivot point at which the linkage is attached to the first side of the mainframe is above the tracks or wheels.

70. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an arm, the loader being adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe, the loader arm not being directly attached to the mainframe;

a linkage pivotally attached to the first side of the mainframe at a linkage pivot point and pivotally attached to the loader arm;

an actuator pivotally attached to the first side of the mainframe at an actuator pivot point and pivotally attached to the loader arm;

a drive mechanism comprising a drive sprocket and tracks for propelling the compact tool carrier over a supporting surface, at least a portion of the tracks angling downward from the drive sprocket toward the front end of the mainframe, the linkage pivot point being disposed above the portion of the tracks that angles downward from the drive sprocket toward the front end of the mainframe; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation.

71. The compact tool carrier as set forth in claim 70 wherein the linkage is a first linkage and the linkage pivot point is a first linkage pivot point, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a second linkage pivot point and pivotally attached to the loader arm, the first linkage being forward of the second linkage.

72. The compact tool carrier as set forth in claim 70 further comprising an operator platform for standing operation of the operator controls of the control station, the operator platform extending from the mainframe, at least a portion of the operator platform being forward of the rear end of the mainframe.

73. The compact tool carrier as set forth in claim 70 wherein the mainframe incorporates a single weldment.

74. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an arm, the loader being adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being

spaced from the rear end of the mainframe, the loader arm not being directly attached to the mainframe;

a first linkage pivotally attached to the first side of the mainframe at a first linkage pivot point and pivotally attached to the loader arm;

a second linkage pivotally attached to the first side of the mainframe at an second linkage pivot point and pivotally attached to the loader arm;

an actuator pivotally attached to the first side of the mainframe at an actuator pivot point and pivotally attached to the loader arm;

a drive mechanism comprising a drive sprocket and tracks for propelling the compact tool carrier over a supporting surface, the tracks being spaced from the rear end of the mainframe, at least a portion of the tracks angling downward from the drive sprocket toward the front end of the mainframe, each of the first linkage pivot point, second linkage pivot point, and actuator pivot point being (1) disposed above at least part of the portion of the tracks that angles downward from the drive sprocket toward the front end of the mainframe or (2) disposed between the tracks and the rear end of the mainframe; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation; and

an operator platform for standing operation of the operator controls of the control station.

75. The compact tool carrier as set forth in claim 74 wherein the first linkage is forward of the second linkage, the first linkage being disposed above the portion of the tracks that angles downward from the drive sprocket toward the front end of the mainframe.

76. The compact tool carrier as set forth in claim 74 wherein the operator platform extends from the mainframe, at least a portion of the operator platform being forward of the rear end of the mainframe.

77. The compact tool carrier as set forth in claim 74 wherein the mainframe incorporates a single weldment.

78. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an arm, the loader being adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe, the loader arm not being directly attached to the mainframe;

a linkage pivotally attached to the first side of the mainframe at a linkage pivot point and pivotally attached to the loader arm;

an actuator pivotally attached to the first side of the mainframe at an actuator pivot point and pivotally attached to the loader arm;

a drive mechanism comprising a drive sprocket and tracks for propelling the compact tool carrier over a supporting surface, the tracks being spaced from the rear end of the mainframe; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation; and

an operator platform for standing operation of the operator controls of the control station that extends from the mainframe, at least a portion of the operator platform being forward of the rear end of the mainframe.

79. The compact tool carrier as set forth in claim 78 wherein the mainframe incorporates a single weldment.

80. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an arm, the loader being adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe, each side having a top and a bottom, the first side of the mainframe having at least two pivot points relative to the loader, the loader arm not being directly attached to the mainframe;

a linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;

an actuator pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;

a drive mechanism comprising tracks for propelling the compact tool carrier over a supporting surface, the drive mechanism having a rotational axis, the compact tool carrier having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis and bottom of the compact tool carrier being separated by a vertical distance D1, the rotational axis and the bottom of the first side of the mainframe being separated by a vertical distance D5, the rotational axis and the pivot point at which the linkage is attached to the mainframe being separated by a vertical distance D2, the rotational axis and the pivot point at which the actuator is attached to the mainframe being separated by a vertical distance D4, both D2 and D4 being less than 2.0 D5, the pivot point at which the linkage is attached to the mainframe being disposed above the tracks; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation.

81. The compact tool carrier as set forth in claim 80 further comprising an operator platform for standing operation of the operator controls of the control station, the operator platform extending from the mainframe, at least a portion of the operator platform being forward of the rear end of the mainframe.

82. The compact tool carrier as set forth in claim 81 wherein the mainframe incorporates a single weldment.

83. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an arm, the loader being adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe, each side having a top and a bottom, the first side of the mainframe having at least two pivot points relative to the loader, the loader arm not being directly attached to the mainframe;

a linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;

an actuator pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;

a drive mechanism comprising tracks for propelling the compact tool carrier over a supporting surface, the drive mechanism having a rotational axis, the compact tool carrier having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis and bottom of the compact tool carrier being separated by a vertical distance D1, the rotational axis and the bottom of the first side of the mainframe being separated by a vertical distance D5, the rotational axis and the pivot point at which the linkage is attached to the mainframe being separated by a vertical distance D2, the rotational axis and the pivot point at which the actuator is attached to the mainframe being separated by a vertical distance D4, both D2 and D4 being less than 2.0 D5, the pivot point at which the actuator is attached to the mainframe being above the rotational axis; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation.

84. The compact tool carrier as set forth in claim 83 further comprising an operator platform for standing operation of the operator controls of the control station, the operator platform extending from the mainframe, at least a portion of the operator platform being forward of the rear end of the mainframe.

85. The compact tool carrier as set forth in claim 83 wherein the mainframe incorporates a single weldment.

86. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an arm, the loader being adapted to carry a tool, the loader being moveable between a down position and a vertically raised position;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe, the loader arm not being directly attached to the mainframe;

a first linkage pivotally attached to the first side of the mainframe at a first linkage pivot point and pivotally attached to the loader arm;

a second linkage pivotally attached to the first side of the mainframe at a second linkage pivot point and pivotally attached to the loader arm;

an actuator pivotally attached to the first side of the mainframe at an actuator pivot point and pivotally attached to the loader arm;

a drive mechanism comprising tracks or wheels, the drive mechanism having a rotational axis, the pivot point at which the actuator is attached to the mainframe being above the rotational axis;

an attachment plate for removably attaching a tool to the compact tool carrier, at least a portion of the attachment plate being forward of the drive mechanism when the loader is in the vertically raised position;

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation; and

an operator platform for standing operation of the operator controls of the control station.

87. The compact tool carrier as set forth in claim 86 wherein the mainframe incorporates a single weldment.

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